ELECTROMAGNETICALLY ACTUATED FUEL INJECTION VALVE

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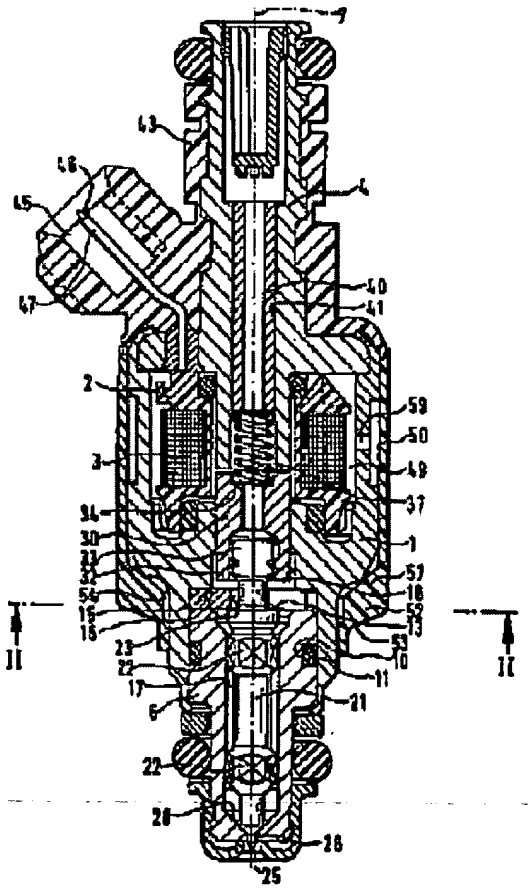
Abstract of **JP8004622**

PURPOSE: To avoid penetration of liquid into the inside of a valve to eliminate corrosion on contact pins or on a coil wire.
CONSTITUTION: In this fuel injection valve, a protective sleeve 50 at least radially completely surrounds a valve housing 1. The protective sleeve 50 is formed such that at least a prescribed part of the protective sleeve 50 is apart from the valve housing 1 to form a chamber 54. One end part of the protective sleeve 50 is tightly connected with a plastic covering body 43, while the other end part of the protective sleeve 50 has a play to the valve housing 1.



JAPANESE [JP,08-004622,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] Valve housing which is the fuel injection valve of an electromagnetic-action type used for an internal combustion engine's fuel injection equipment, and consists of a ferromagnetic ingredient, electromagnetism -- a coil -- this -- electromagnetism -- with the coil frame which encloses a coil partially at least The needle which collaborates with a core and this core, and the plastic lining object which encloses said valve housing partially at least, The electric connection connector similarly formed from plastics is prepared. In the thing of the format that excitation of a coil is performed this connection connector -- at least two contact pins -- belonging -- **** -- this contact pin -- minding -- said electromagnetism -- Valve housing (1) is completely enclosed at least by the protectove sleeve (50) by radial. The predetermined range of said protectove sleeve (50) is formed at least so that ** (54) may be formed based on spatial spacing of this protectove sleeve (50) and valve housing (1). The fuel injection valve of the electromagnetic-action type which one edge of said protectove sleeve (50) is densely combined with the plastic lining object (43), and is characterized by the other-end section of said protectove sleeve (50) having play to valve housing (1).
[Claim 2] The fuel injection valve according to claim 1 in which the aforementioned room (54) formed between valve housing (1) and said protectove sleeve (50) is formed in of the web (57) of a large number projected from the wall of said protectove sleeve (50) to the radial inside, as a result the aforementioned room (54) has many small paths.
[Claim 3] The fuel injection valve according to claim 1 in which it is formed in of the web (57) of a large number by which the aforementioned room (54) formed between valve housing (1) and said protectove sleeve (50) has been circularly arranged, and was incorporated mutually in and abroad, as a result the aforementioned room (54) has many small paths.
[Claim 4] The fuel injection valve according to claim 1 by which said protectove sleeve (50) is manufactured from plastics, and is being densely fixed to the plastic lining object (43) by ultrasonic welding.
[Claim 5] The fuel injection valve according to claim 1 to which the aforementioned room (54) is located in a reverse near edge (52) with the plastic lining object (43) of said protectove sleeve (50).
[Claim 6] The fuel injection valve according to claim 1 in which the volume of the aforementioned room (54) is formed more greatly than the "respiratory volume" of the fuel injection valve in the usual operating-temperature region.
[Claim 7] The fuel injection valve given [to claims 1-6] in any 1 term in which the compensation hole (59) which led to the peripheral surface of valve housing (1) from the coil room (49) is prepared.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Valve housing which this invention is a fuel injection valve of an electromagnetic-action type used for an internal combustion engine's fuel injection equipment, and consists of a ferromagnetic ingredient, electromagnetism -- a coil -- this -- electromagnetism -- with the coil frame which encloses a coil partially at least The needle which collaborates with a core and this core, and the plastic lining object which encloses said valve housing partially at least, the electric connection connector similarly formed from plastics prepares -- having -- **** -- this connection connector -- at least two contact pins -- belonging -- **** -- this contact pin -- minding -- said electromagnetism -- it is related with the thing of the format that excitation of a coil is performed.
[0002]
[Description of the Prior Art] Many fuel injection valves are already well-known. For example, based on the Europe patent No. 0348786 specification, the well-known fuel injection valve has the electric connection connector. this electrical connector -- minding -- electromagnetism -- electric contact connection of a coil, as a result electromagnetism -- excitation of a coil is performed. This contact connection itself is performed through a metallic contact pin. this contact pin -- electromagnetism -- it has extended even from the coil to the connection connector of a proper, and is fully surrounded by plastics at the time of injection molding of plastics. The plastic lining at the time of injection molding encloses valve housing partially at least.
[0003] association between the plastic lining objects, the contact pins, or valve housing by plastics injection molding -- a pressure -- it is not dense. A very detailed capillary tube gap will be formed of the contraction property of the plastics after injection molding, not to mention it, and this capillary tube gap will accomplish the free passage section of a coil room and the perimeter of the exterior.
[0004] the time of operation of an internal combustion engine or a fuel injection valve -- electromagnetism -- the coil room of a coil is heated. Volume compensation with the air which the interior of a valve was heated and expanded, and the circumference atmospheric air which encloses a valve is performed. If a valve is cooled from operation standby, circumference air will be inhaled by the coil room through the capillary tube gap between a plastic lining object, a contact pin, or valve housing. That is, the interior of a valve "breathes." If cooling of an injection valve is performed by droplet water or droplet water piles up in a capillary tube gap at the time of cooling, a liquid will be absorbed by especially the coil room inside a valve. Consequently, corrosion arises in a contact pin and a coil wire rod, and this corrosion has a possibility of causing destruction of a coil wire rod.
[0005]
[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering a fuel injection valve by which the fuel injection valve of the format stated at the beginning is improved, intake of the liquid inside a valve is avoided, and the corrosion of a contact pin or a coil wire rod is eliminated.
[0006]
[Means for Solving the Problem] In order to solve this technical problem with the configuration of this invention Valve housing is completely enclosed at least by the protectove sleeve by radial. The predetermined range of said protectove sleeve is formed at least so that ** may be formed based on spatial spacing of this protectove sleeve and valve housing. One edge of said protectove sleeve is densely combined with the plastic lining object, and it was made for the other-end section of said protectove sleeve to have play to valve housing.
[0007]
[Effect of the Invention] The fuel injection valve by this invention has the following advantages compared with the conventional thing. That is, smooth "breathing" of the room in a valve can be performed, without the droplet water or

another liquid which piled up being especially conveyed by the coil interior of a room and the contact pin inside a valve. For this purpose, without closing the capillary tube gap produced by the case between the plastic lining objects and valve housing which are formed by plastics injection molding, since a strong cheap and protectove sleeve is fixed to the peripheral face of a valve, it is advantageous. That is, the liquid which piled up is absorbed between valve housing and a protectove sleeve without strong resistance at the time of "breathing" of a valve, and a liquid does not arrive at the interior of a valve in this case. This is secured by the reason the volume formed between a protectove sleeve and valve housing is formed more greatly than the "respiratory" compensation volume formed of the temperature rise of the air enclosed with the interior of a valve.

[0008] With the means of a publication, advantageous amelioration of a fuel injection valve according to claim 1 is attained [two or less-claim].

[0009] It is advantageous especially if many small paths are formed in the protectove sleeve. Since this path is formed with a small rib, the big internal volume which has a big front face is obtained. Therefore, it is guaranteed that the liquid absorbed also in the time of a rocking load or location change keeps away from a capillary tube gap. That is, the capillary tube holding power produced based on a small path prevents migration of the absorbed liquid. Although the absorbed little liquid evaporates away again after a short time through the fuel injection valve always heated newly, this is not a prerequisite for functionalization of a protectove sleeve.

[0010] When a capillary tube gap is not enough for the non-pressure volume compensation between a coil room and ** formed between valve housing and a protectove sleeve, it is advantageous if a compensation hole is prepared in valve housing.

[0011]

[Example] Below, the example of this invention is explained in detail per drawing.

[0012] The fuel injection valve of an electromagnetic-action type which was illustrated to drawing 1 and which is used for an internal combustion engine's fuel injection equipment has the valve housing 1 of the shape of tubing which consists of a ferromagnetic ingredient. the inside of this valve housing 1 -- the coil frame 2 -- electromagnetism -- the coil 3 is arranged. The coil frame 2 encloses partially the core 4 prolonged in the said alignment to the valve longitudinal direction axis 7 formed in the shape of a stage. This core 4 is formed in the shape of tubing, and fuel supply is performed through this core 4. the valve housing 1 -- electromagnetism -- it is a reverse near edge in a coil 3, and the nozzle body 6 is partially surrounded in shaft orientations. between the valve housing 1 and nozzle bodies 6 -- liquid -- in order to carry out a seal densely, the circular sulcus 10 is formed in the peripheral surface of a nozzle body 6. The seal ring 11 is arranged in this circular sulcus 10.

[0013] the electromagnetism of a nozzle body 6 -- between the end face 13 of coil 3 approach, and the inside shoulder 15 which faces each other and is located in this end face 13 by shaft orientations and which was prepared in the valve housing 1, the stopper plate 16 binds tight and is being fixed. This stopper plate 16 works in order to restrict movement of the valve needle 21. This valve needle 21 has rushed into the longitudinal direction hole 18 which has been arranged in the longitudinal direction hole 17 which has the guide range established in the nozzle body 6, and by which joggling was carried out, and was prepared in the valve housing 1 and by which joggling was carried out. Two guide partitions 22 formed as a square object are guided through the guide range of the longitudinal direction hole 17 at the valve needle 21. However, said guide partition 22 has opened the shaft-orientations passage section for a fuel wide. The valve needle 21 had a radial play, has pierced through the through tube 23 prepared in the stopper plate 16, and has projected the edge of the downstream equipped with the needle pin 25 of the valve needle 21 from the injection opening 26 prepared in the nozzle body 6. The bearing surface 28 of a truncated-cone form is formed in the edge of the reverse near downstream in said stopper plate 16 of a nozzle body 6. This bearing surface 28 collaborates with the edge which works as a valve block part of the valve needle 21, and opens and closes a fuel injection valve.

[0014] The other-end section of the valve needle 21 is firmly combined with the tubing-like needle 30, and in this case, this needle 30 encloses a part for the attaching part 33 of the valve needle 21 in the range 32 of bearing-surface 28 approach, and is engaging with a part for this attaching part 33. the electromagnetism of a needle 30 -- one edge of a return spring 37 touches the step 34 of coil 3 approach. The other-end section of a return spring 37 is supported by the tubing-like accommodation sleeve 40. It is press ** carried out of this accommodation sleeve 40 to the through tube 41 which was prepared in the core 4 and by which joggling was carried out.

[0015] A core 4 and the valve housing 1 are partially surrounded with the plastic lining object 43 at least in shaft orientations. electromagnetism -- contact connection is made through the electric connection connector 45, as a result a coil 3 is excited. This electric connection connector 45 is fabricated together with the plastic lining object 43. Two metallic contact pins 46 belong to the connection connector 45 manufactured from plastics. both the contact pin 46 -- electromagnetism -- it connects with the volume object of a coil 3 directly. the contact pin 46 -- the upstream -- it is --

electromagnetism -- it has projected from the coil frame 2 which encloses a coil 3, and is fully surrounded by plastics at the time of plastics injection molding. The denudation of the contact pin 46 has not been carried out at the pin edge 47. That is, since the pin edge 47 is not directly surrounded by plastics, the push-in connection with a part for a corresponding connector area (not shown) of it is attained.

[0016] Association between a plastics part and a metal part is not completely dense. That is, also in a fuel injection valve, it is impossible to guarantee perfect seal nature in the range surrounded by plastics at the time of plastics injection molding of the contact pin 46 and the range of the edge of said injection opening 26 approach of the plastic lining object 43 covered by the valve housing 1. A very detailed capillary tube gap will be formed between the metal part 46, for example, a contact pin, not to mention it, and the plastic lining object 43. At the time of a heat operation, especially this effectiveness is amplified further. It is because an ingredient gap is made to arise based on the coefficient-of-thermal-expansion difference of plastics and a metal. the time of operation of an internal combustion engine or a fuel injection valve -- especially -- an internal combustion engine -- being based -- moreover, electromagnetism -- heating of a coil 3 -- electromagnetism -- a temperature rise is made to arise in the range of a coil 3 and the connection connector 45 This temperature rise promotes formation of a capillary tube gap too. Since a direct free passage is made to arise based on formation of a very detailed capillary tube gap between the air enclosed between the coil frame 2 and the valve housing 1, and the circumference atmospheric air which exists in the exterior of a fuel injection valve, there is a possibility that a fuel injection valve may carry out the so-called "breathing."

[0017] the time of the temperature rise at the time of operation of a fuel injection valve -- electromagnetism -- since internal pressure is decompressed through a capillary tube gap by the method of outside based on the cubical expansion of air by which coil 3 **** enclosure was carried out, a pressure balance is maintained. In the time of cooling, pressure compensation is performed in a reverse direction. If especially the internal combustion engine is remarkably exposed to the risk of droplet water, the risk of an inflow of the liquid inside a fuel injection valve will become very large. Since only pure water is not necessarily sucked in by the capillary tube gap and another particle (for example, salt) is also taken, the corrosion in the coil room 49 will be promoted further, therefore the destructive risk of a coil wire rod is not eliminated.

[0018] According to this invention, this problem is solved by the protectove sleeve 50 which works as a droplet water guard. This protectove sleeve 50 encloses the fuel injection valve completely by radial partially at least on the periphery at shaft orientations. for example, the upper limit section of connection connector 45 approach of the protectove sleeve 50 of the shape of tubing manufactured from plastics -- an ingredient -- it fixes to the plastic lining object 43 densely by ultrasonic welding connectively that is, -- having -- **** -- it -- receiving -- the lower limit section of injection opening 26 approach of a protectove sleeve 50 -- the valve housing 1 -- playing -- inserting in -- it surrounds. By this, the "respiratory air" of an injection valve flows into the annular gap formed between the valve housing 1 and a protectove sleeve 50 through the capillary tube gap between the metallic valve housing 1 and the plastic lining object 43, respectively. Besides plastics, another ingredient, for example, a metal, can be used for a protectove sleeve 50. It is the edge 52 of injection opening 26 approach, and a protectove sleeve 50 is similar to a profile outside the valve housing 1, and joggling of it is carried out and it is formed. Although the step 53 of the outside lower part of a protectove sleeve 50 encloses the valve housing 1, it is surrounded with predetermined spacing. ** 54 formed between a protectove sleeve 50 and the valve housing 1 holds the liquid absorbed by "breathing" between a protectove sleeve 50 and the valve housing 1, and it works in order to hold.

[0019] The aforementioned room 54 is divided into many small paths or capillary tubes. These paths or capillary tubes are formed with the rib 57 which rushed into the radial inside from the wall of a protectove sleeve 50. In this case, one path between which it is placed by two ribs 57 each is restricted. The configuration of a rib 57 is shown in drawing 2 as a sectional view of the fuel injection valve equipped with the protectove sleeve 50. The volume of the path formed between each rib 57 is far formed greatly from the "respiratory volume" produced over an internal combustion engine or the operating-temperature region of a fuel injection valve. It is guaranteed that the absorbed liquid does not flow into the interior of a fuel injection valve by this. The labyrinth of many small paths formed with the rib 57, not to mention it, prevents that the liquid absorbed based on capillary tube holding power at the time of a rocking load or location change advances even into the coil room 49 by which the amount of interior of a fuel proposal was carried out [the seal].

[0020] When a capillary tube gap is not enough for the non-pressure volume compensation between a coil room and ** 54 formed between the valve housing 1 and a protectove sleeve 50, it is advantageous to form the compensation hole 59 which led to the peripheral surface of the valve housing 1 from the coil room 49 in the range covered by the protectove sleeve 50.

[0021] Another example for forming in drawing 3 the labyrinth which has many paths established in the protectove

sleeve 50 is shown. The rib 57 is not arranged so that it may extend in radial, and it is arranged so that it may extend along a circular orbit. Also according to another example (not shown), said function can be correctly filled to the pan which has the arrangement format that said paths differ variously.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] valve housing which this invention is a fuel injection valve of an electromagnetic-action type used for an internal combustion engine's fuel injection equipment, and consists of a ferromagnetic ingredient, and electromagnetism -- a coil -- this -- electromagnetism -- the electric connection connector formed from plastics as well as the needle which collaborates with the coil frame which encloses a coil partially at least, a core, and this core, and the plastic lining object which encloses said valve housing partially at least is prepared. this connection connector -- at least two contact pins -- belonging -- **** -- this contact pin -- minding -- said electromagnetism -- it is related with the thing of the format that excitation of a coil is performed.

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PRIOR ART

[Description of the Prior Art] Many fuel injection valves are already well-known. For example, based on the Europe patent No. 0348786 specification, the well-known fuel injection valve has the electric connection connector. this electrical connector -- minding -- electromagnetism -- electric contact connection of a coil, as a result electromagnetism -- excitation of a coil is performed. This contact connection itself is performed through a metallic contact pin. this contact pin -- electromagnetism -- it has extended even from the coil to the connection connector of a proper, and is fully surrounded by plastics at the time of injection molding of plastics. The plastic lining at the time of injection molding encloses valve housing partially at least.
[0003] association between the plastic lining objects, the contact pins, or valve housing by plastics injection molding -- a pressure -- it is not dense. A very detailed capillary tube gap will be formed of the contraction property of the plastics after injection molding, not to mention it, and this capillary tube gap will accomplish the free passage section of a coil room and the perimeter of the exterior.
[0004] the time of operation of an internal combustion engine or a fuel injection valve -- electromagnetism -- the coil room of a coil is heated. Volume compensation with the air which the interior of a valve was heated and expanded, and the circumference atmospheric air which encloses a valve is performed. If a valve is cooled from operation standby, circumference air will be inhaled by the coil room through the capillary tube gap between a plastic lining object, a contact pin, or valve housing. That is, the interior of a valve "breathes." If cooling of an injection valve is performed by droplet water or droplet water piles up in a capillary tube gap at the time of cooling, a liquid will be absorbed by especially the coil room inside a valve. Consequently, corrosion arises in a contact pin and a coil wire rod, and this corrosion has a possibility of causing destruction of a coil wire rod.

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EFFECT OF THE INVENTION

[Effect of the Invention] The fuel injection valve by this invention has the following advantages compared with the conventional thing. That is, smooth "breathing" of the room in a valve can be performed, without the droplet water or another liquid which piled up being especially conveyed by the coil interior of a room and the contact pin inside a valve. For this purpose, without closing the capillary tube gap produced by the case between the plastic lining objects and valve housing which are formed by plastics injection molding, since a strong cheap and protectove sleeve is fixed to the peripheral face of a valve, it is advantageous. That is, the liquid which piled up is absorbed between valve housing and a protectove sleeve without strong resistance at the time of "breathing" of a valve, and a liquid does not arrive at the interior of a valve in this case. This is secured by the reason the volume formed between a protectove sleeve and valve housing is formed more greatly than the "respiratory" compensation volume formed of the temperature rise of the air enclosed with the interior of a valve.
[0008] With the means of a publication, advantageous amelioration of a fuel injection valve according to claim 1 is attained [two or less-claim].
[0009] It is advantageous especially if many small paths are formed in the protectove sleeve. Since this path is formed with a small rib, the big internal volume which has a big front face is obtained. Therefore, it is guaranteed that the liquid absorbed also in the time of a rocking load or location change keeps away from a capillary tube gap. That is, the capillary tube holding power produced based on a small path prevents migration of the absorbed liquid. Although the absorbed little liquid evaporates away again after a short time through the fuel injection valve always heated newly, this is not a prerequisite for functionalization of a protectove sleeve.
[0010] When a capillary tube gap is not enough for the non-pressure volume compensation between a coil room and ** formed between valve housing and a protectove sleeve, it is advantageous if a compensation hole is prepared in valve housing.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering a fuel injection valve by which the fuel injection valve of the format stated at the beginning is improved, intake of the liquid inside a valve is avoided, and the corrosion of a contact pin or a coil wire rod is eliminated.

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MEANS

[Means for Solving the Problem] In order to solve this technical problem with the configuration of this invention Valve housing is completely enclosed at least by the protectove sleeve by radial. The predetermined range of said protectove sleeve is formed at least so that ** may be formed based on spatial spacing of this protectove sleeve and valve housing. One edge of said protectove sleeve is densely combined with the plastic lining object, and it was made for the other-end section of said protectove sleeve to have play to valve housing.

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EXAMPLE

[Example] Below, the example of this invention is explained in detail per drawing.
[0012] The fuel injection valve of an electromagnetic-action type which was illustrated to drawing 1 and which is used for an internal combustion engine's fuel injection equipment has the valve housing 1 of the shape of tubing which consists of a ferromagnetic ingredient. the inside of this valve housing 1 -- the coil frame 2 -- electromagnetism -- the coil 3 is arranged. The coil frame 2 encloses partially the core 4 prolonged in the said alignment to the valve longitudinal direction axis 7 formed in the shape of a stage. This core 4 is formed in the shape of tubing, and fuel supply is performed through this core 4. the valve housing 1 -- electromagnetism -- it is a reverse near edge in a coil 3, and the nozzle body 6 is partially surrounded in shaft orientations. between the valve housing 1 and nozzle bodies 6 -- liquid -- in order to carry out a seal densely, the circular sulcus 10 is formed in the peripheral surface of a nozzle body 6. The seal ring 11 is arranged in this circular sulcus 10.
[0013] the electromagnetism of a nozzle body 6 -- between the end face 13 of coil 3 approach, and the inside shoulder 15 which faces each other and is located in this end face 13 by shaft orientations and which was prepared in the valve housing 1, the stopper plate 16 binds tight and is being fixed. This stopper plate 16 works in order to restrict movement of the valve needle 21. This valve needle 21 has rushed into the longitudinal direction hole 18 which has been arranged in the longitudinal direction hole 17 which has the guide range established in the nozzle body 6, and by which joggling was carried out, and was prepared in the valve housing 1 and by which joggling was carried out. Two guide partitions 22 formed as a square object are guided through the guide range of the longitudinal direction hole 17 at the valve needle 21. However, said guide partition 22 has opened the shaft-orientations passage section for a fuel wide. The valve needle 21 had a radial play, has pierced through the through tube 23 prepared in the stopper plate 16, and has projected the edge of the downstream equipped with the needle pin 25 of the valve needle 21 from the injection opening 26 prepared in the nozzle body 6. The bearing surface 28 of a truncated-cone form is formed in the edge of the reverse near downstream in said stopper plate 16 of a nozzle body 6. This bearing surface 28 collaborates with the edge which works as a valve block part of the valve needle 21, and opens and closes a fuel injection valve.
[0014] The other-end section of the valve needle 21 is firmly combined with the tubing-like needle 30, and in this case, this needle 30 encloses a part for the attaching part 33 of the valve needle 21 in the range 32 of bearing-surface 28 approach, and is engaging with a part for this attaching part 33. the electromagnetism of a needle 30 -- one edge of a return spring 37 touches the step 34 of coil 3 approach. The other-end section of a return spring 37 is supported by the tubing-like accommodation sleeve 40. It is press ** carried out of this accommodation sleeve 40 to the through tube 41 which was prepared in the core 4 and by which joggling was carried out.
[0015] A core 4 and the valve housing 1 are partially surrounded with the plastic lining object 43 at least in shaft orientations. electromagnetism -- contact connection is made through the electric connection connector 45, as a result a coil 3 is excited. This electric connection connector 45 is fabricated together with the plastic lining object 43. Two metallic contact pins 46 belong to the connection connector 45 manufactured from plastics. both the contact pin 46 -- electromagnetism -- it connects with the volume object of a coil 3 directly. the contact pin 46 -- the upstream -- it is -- electromagnetism -- it has projected from the coil frame 2 which encloses a coil 3, and is fully surrounded by plastics at the time of plastics injection molding. The denudation of the contact pin 46 has not been carried out at the pin edge 47. That is, since the pin edge 47 is not directly surrounded by plastics, the push-in connection with a part for a corresponding connector area (not shown) of it is attained.
[0016] Association between a plastics part and a metal part is not completely dense. That is, also in a fuel injection valve, it is impossible to guarantee perfect seal nature in the range surrounded by plastics at the time of plastics injection molding of the contact pin 46 and the range of the edge of said injection opening 26 approach of the plastic lining object 43 covered by the valve housing 1. A very detailed capillary tube gap will be formed between the metal

part 46, for example, a contact pin, not to mention it, and the plastic lining object 43. At the time of a heat operation, especially this effectiveness is amplified further. It is because an ingredient gap is made to arise based on the coefficient-of-thermal-expansion difference of plastics and a metal. the time of operation of an internal combustion engine or a fuel injection valve -- especially -- an internal combustion engine -- being based -- moreover, electromagnetism -- heating of a coil 3 -- electromagnetism -- a temperature rise is made to arise in the range of a coil 3 and the connection connector 45 This temperature rise promotes formation of a capillary tube gap too. Since a direct free passage is made to arise based on formation of a very detailed capillary tube gap between the air enclosed between the coil frame 2 and the valve housing 1, and the circumference atmospheric air which exists in the exterior of a fuel injection valve, there is a possibility that a fuel injection valve may carry out the so-called "breathing."

[0017] the time of the temperature rise at the time of operation of a fuel injection valve -- electromagnetism -- since internal pressure is decompressed through a capillary tube gap by the method of outside based on the cubical expansion of air by which coil 3 **** enclosure was carried out, a pressure balance is maintained. In the time of cooling, pressure compensation is performed in a reverse direction. If especially the internal combustion engine is remarkably exposed to the risk of droplet water, the risk of an inflow of the liquid inside a fuel injection valve will become very large. Since only pure water is not necessarily sucked in by the capillary tube gap and another particle (for example, salt) is also taken, the corrosion in the coil room 49 will be promoted further, therefore the destructive risk of a coil wire rod is not eliminated.

[0018] According to this invention, this problem is solved by the protectove sleeve 50 which works as a droplet water guard. This protectove sleeve 50 encloses the fuel injection valve completely by radial partially at least on the periphery at shaft orientations. for example, the upper limit section of connection connector 45 approach of the protectove sleeve 50 of the shape of tubing manufactured from plastics -- an ingredient -- it fixes to the plastic lining object 43 densely by ultrasonic welding connectively that is, -- having -- **** -- it -- receiving -- the lower limit section of injection opening 26 approach of a protectove sleeve 50 -- the valve housing 1 -- playing -- inserting in -- it surrounds. By this, the "respiratory air" of an injection valve flows into the annular gap formed between the valve housing 1 and a protectove sleeve 50 through the capillary tube gap between the metallic valve housing 1 and the plastic lining object 43, respectively. Besides plastics, another ingredient, for example, a metal, can be used for a protectove sleeve 50. It is the edge 52 of injection opening 26 approach, and a protectove sleeve 50 is similar to a profile outside the valve housing 1, and joggling of it is carried out and it is formed. Although the step 53 of the outside lower part of a protectove sleeve 50 encloses the valve housing 1, it is surrounded with predetermined spacing. ** 54 formed between a protectove sleeve 50 and the valve housing 1 holds the liquid absorbed by "breathing" between a protectove sleeve 50 and the valve housing 1, and it works in order to hold.

[0019] The aforementioned room 54 is divided into many small paths or capillary tubes. These paths or capillary tubes are formed with the rib 57 which rushed into the radial inside from the wall of a protectove sleeve 50. In this case, one path between which it is placed by two ribs 57 each is restricted. The configuration of a rib 57 is shown in drawing 2 as a sectional view of the fuel injection valve equipped with the protectove sleeve 50. The volume of the path formed between each rib 57 is far formed greatly from the "respiratory volume" produced over an internal combustion engine or the operating-temperature region of a fuel injection valve. It is guaranteed that the absorbed liquid does not flow into the interior of a fuel injection valve by this. The labyrinth of many small paths formed with the rib 57, not to mention it, prevents that the liquid absorbed based on capillary tube holding power at the time of a rocking load or location change advances even into the coil room 49 by which the amount of interior of a fuel proposal was carried out [the seal].

[0020] When a capillary tube gap is not enough for the non-pressure volume compensation between a coil room and ** 54 formed between the valve housing 1 and a protectove sleeve 50, it is advantageous to form the compensation hole 59 which led to the peripheral surface of the valve housing 1 from the coil room 49 in the range covered by the protectove sleeve 50.

[0021] Another example for forming in drawing 3 the labyrinth which has many paths established in the protectove sleeve 50 is shown. The rib 57 is not arranged so that it may extend in radial, and it is arranged so that it may extend along a circular orbit. Also according to another example (not shown), said function can be correctly filled to the pan which has the arrangement format that said paths differ variously.

[Translation done.]

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of a fuel injection valve.
[Drawing 2] It is the sectional view which met the II-II line of the fuel injection valve shown in drawing 1 .
[Drawing 3] It is the sectional view showing another example of the path formation in a protectove sleeve.
[Description of Notations]
1 Valve Housing 2 Coil Frame 3 Electromagnetism -- Coil -- 4 Core Six nozzle bodies 7 Valve longitudinal direction axis, 10 Circular sulcus 11 Seal ring 13 End face, 15 Inside shoulder 16 Stopper plate 17 Longitudinal direction hole, 18 Longitudinal direction opening 21 Valve needle 22 Guide partition, 23 Penetration opening 25 Needle pin 26 Injection opening, 28 A bearing surface, 30 Needle 32 Range 33 A part for an attaching part, 34 A step, 37 Return spring 40 Accommodation sleeve, 41 A through tube, 43 Plastic lining object 45 Connection connector, 46 contact pin 47 Pin edge 49 coil room 50 protectove sleeves 52 Edge 53 Step 54 Room 57 Rib 59 Compensation hole

[Translation done.]

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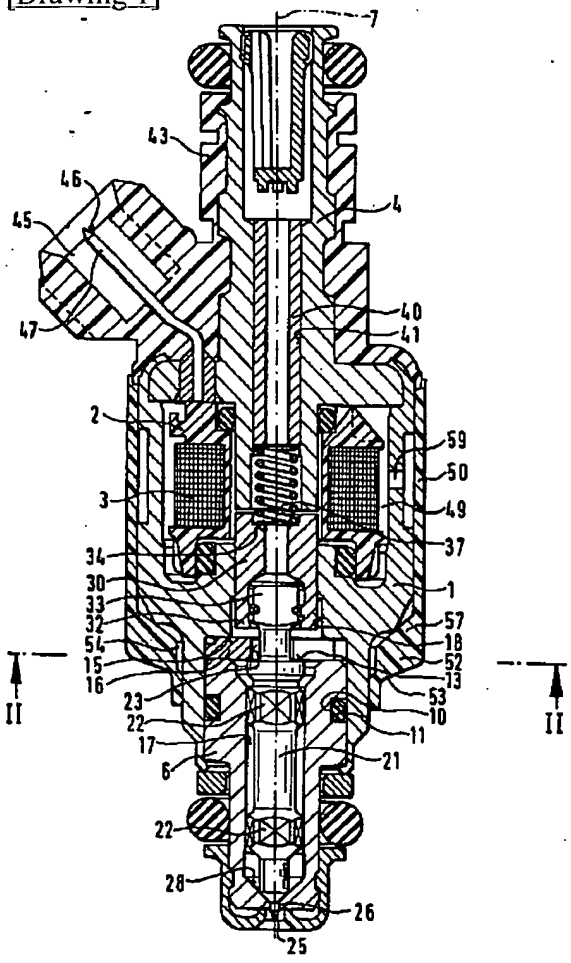
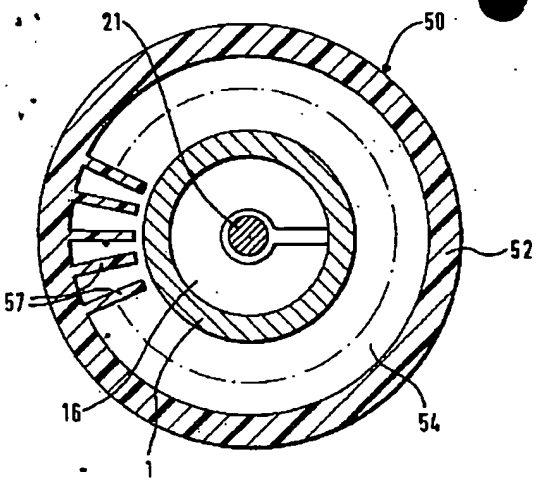
DRAWINGS

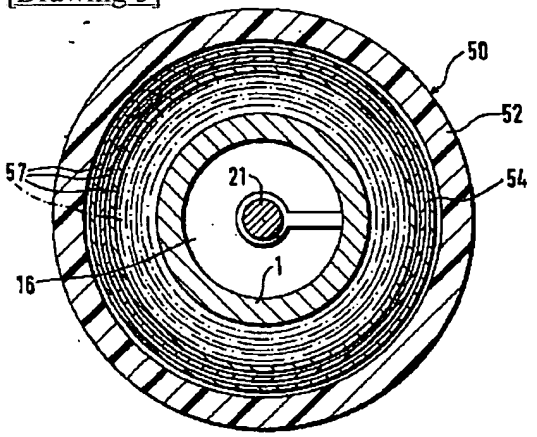
[Drawing 1]



[Drawing 2]



[Drawing 3]



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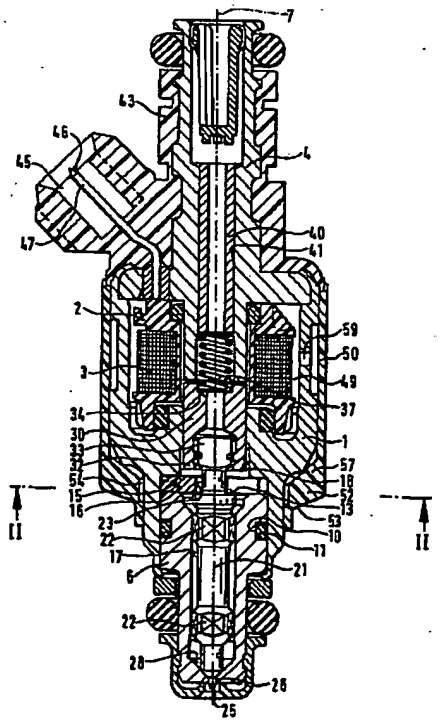
最終頁に続く

(54)【発明の名称】　電磁作動式の燃料噴射弁

(57)【要約】

【目的】　弁内部への液体の吸込を回避し、ひいてはコンタクトピンもしくはコイル線材の腐食を排除する。

【構成】　弁ハウジング１が保護スリーブ５０によって少なくとも半径方向で完全に取り囲まれており、該保護スリーブ５０と弁ハウジング１との空間的な間隔に基づき室５４が形成されるように前記保護スリーブ５０の少なくとも所定の範囲が形成されており、前記保護スリーブ５０の一方の端部がプラスチック被覆体４３と密に結合されており、前記保護スリーブ５０の他方の端部が弁ハウジング１に対して遊びを有している。



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【特許請求の範囲】

【請求項１】　内燃機関の燃料噴射装置に用いられる電磁作動式の燃料噴射弁であって、強磁性材料から成る弁ハウジングと、電磁コイルと、該電磁コイルを少なくとも部分的に取り囲むコイル枠体と、コアと、該コアと協働する可動子と、前記弁ハウジングを少なくとも部分的に取り囲むプラスチック被覆体と、同じくプラスチックから形成された電気的な接続コネクタとが設けられており、該接続コネクタに少なくとも２つのコンタクトピンが所属しており、該コンタクトピンを介して前記電磁コイルの励磁が行なわれる形式のものにおいて、弁ハウジング（１）が保護スリーブ（５０）によって少なくとも半径方向で完全に取り囲まれており、該保護スリーブ（５０）と弁ハウジング（１）との空間的な間隔に基づき室（５４）が形成されるように前記保護スリーブ（５０）の少なくとも所定の範囲が形成されており、前記保護スリーブ（５０）の一方の端部がプラスチック被覆体（４３）と密に結合されており、前記保護スリーブ（５０）の他方の端部が弁ハウジング（１）に対して遊びを有していることを特徴とする、電磁作動式の燃料噴射弁。

【請求項２】　弁ハウジング（１）と前記保護スリーブ（５０）との間に形成された前記室（５４）が、前記保護スリーブ（５０）の内壁から半径方向内側に突出した多数のウェブ（５７）によって形成されていて、ひいては前記室（５４）が多数の小さな通路を有している、請求項１記載の燃料噴射弁。

【請求項３】　弁ハウジング（１）と前記保護スリーブ（５０）との間に形成された前記室（５４）が、円形に配置されて互いに内外に組み込まれた多数のウェブ（５７）によって形成されていて、ひいては前記室（５４）が多数の小さな通路を有している、請求項１記載の燃料噴射弁。

【請求項４】　前記保護スリーブ（５０）がプラスチックから製造されていて、超音波溶接によってプラスチック被覆体（４３）に密に固定されている、請求項１記載の燃料噴射弁。

【請求項５】　前記室（５４）が、前記保護スリーブ（５０）の、プラスチック被覆体（４３）とは反対の側の端部（５２）に位置している、請求項１記載の燃料噴射弁。

【請求項６】　前記室（５４）の体積が、通常の運転温度域における燃料噴射弁の「呼吸体積」よりも大きく形成されている、請求項１記載の燃料噴射弁。

【請求項７】　コイル室（４９）から弁ハウジング（１）の周面に通じた補償孔（５９）が設けられている、請求項１から６までのいずれか１項記載の燃料噴射弁。

【発明の詳細な説明】

【０００１】

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【産業上の利用分野】本発明は、内燃機関の燃料噴射装置に用いられる電磁作動式の燃料噴射弁であって、強磁性材料から成る弁ハウジングと、電磁コイルと、該電磁コイルを少なくとも部分的に取り囲むコイル枠体と、コアと、該コアと協働する可動子と、前記弁ハウジングを少なくとも部分的に取り囲むプラスチック被覆体と、同じくプラスチックから形成された電気的な接続コネクタとが設けられており、該接続コネクタに少なくとも２つのコンタクトピンが所属しており、該コンタクトピンを介して前記電磁コイルの励磁が行なわれる形式のものに関する。

【０００２】

【従来の技術】既に多数の燃料噴射弁が公知である。たとえば欧州特許第０３４８７８６号明細書に基づき公知の燃料噴射弁は電気的な接続コネクタを有している。この電気コネクタを介して電磁コイルの電気的な接触接続、ひいては電磁コイルの励磁が行なわれる。この接触接続自体は金属性のコンタクトピンを介して行なわれる。このコンタクトピンは電磁コイルから固有の接続コネクタにまで延びていて、プラスチックの射出成形時にプラスチックによって十分に取り囲まれる。射出成形時のプラスチック被覆は弁ハウジングを少なくとも部分的に取り囲む。

【０００３】プラスチック射出成形によるプラスチック被覆体とコンタクトピンもしくは弁ハウジングとの間の結合は、圧力密ではない。それどころか、射出成形後のプラスチックの収縮特性により、極めて微細な毛管ギャップが形成され、この毛管ギャップはコイル室と、外部周囲との連通部を成してしまう。

【０００４】内燃機関もしくは燃料噴射弁の運転時では、電磁コイルのコイル室が加熱される。弁内部の加熱されて膨張した空気と、弁を取り囲む周辺大気との体積補償が行なわれる。弁が運転暖機状態から冷却されると、プラスチック被覆体とコンタクトピンもしくは弁ハウジングとの間の毛管ギャップを介してコイル室に周辺空気が吸い込まれる。すなわち、弁内部が「呼吸」してしまう訳である。噴射弁の冷却が飛沫水によって行なわれるか、もしくは冷却時に飛沫水が毛管ギャップに滞留すると、液体が弁内部に、特にコイル室に吸い込まれる。その結果、コンタクトピンおよびコイル線材に腐食が生じ、この腐食はコイル線材の破壊を招くおそれがある。

【０００５】

【発明が解決しようとする課題】本発明の課題は、冒頭で述べた形式の燃料噴射弁を改良して、弁内部への液体の吸込が回避されて、コンタクトピンもしくはコイル線材の腐食が排除されているような燃料噴射弁を提供することである。

【０００６】

【課題を解決するための手段】この課題を解決するため

に本発明の構成では、弁ハウジングが保護スリーブによって少なくとも半径方向で完全に取り囲まれており、該保護スリーブと弁ハウジングとの空間的な間隔に基づき室が形成されるように前記保護スリーブの少なくとも所定の範囲が形成されており、前記保護スリーブの一方の端部がプラスチック被覆体と密に結合されており、前記保護スリーブの他方の端部が弁ハウジングに対して遊びを有しているようにした。

【０００７】

【発明の効果】本発明による燃料噴射弁は従来のものに比べて次のような利点を有している。すなわち、滞留した飛沫水または別の液体が弁内部に、特にコイル室内とコンタクトピンとに搬送されることなしに、弁内室のスムーズな「呼吸」を行なうことができる。この目的のためには、プラスチック射出成形により形成されるプラスチック被覆体と弁ハウジングとの間に場合によって生じる毛管ギャップを閉鎖することなしに、弁の外周面に廉価でかつ丈夫な保護スリーブを固定するので有利である。すなわち、滞留した液体は大きな抵抗なく弁の「呼吸」時に弁ハウジングと保護スリーブとの間に吸い込まれ、この場合、液体は弁内部には到達しない。このことは、保護スリーブと弁ハウジングとの間に形成された体積が、弁内部に封入された空気の温度上昇により形成された「呼吸」補償体積よりも大きく形成されているという理由で確保される。

【０００８】請求項２以下に記載の手段により、請求項１に記載の燃料噴射弁の有利な改良が可能となる。

【０００９】保護スリーブに多数の小さな通路が形成されていると特に有利である。この通路は小幅のリブによって形成されるので、大きな表面を有する大きな内部体積が得られる。したがって、揺動負荷時または位置変化時でも吸い込まれた液体が毛管ギャップから遠ざけられることが保証される。すなわち、小さな通路に基づき生じる毛管保持力は吸い込まれた液体の移動を阻止する訳である。常時新たに加熱される燃料噴射弁を介して、吸い込まれた少量の液体は短時間の後に再び蒸発し去るが、しかしこのことは保護スリーブの機能化のための前提条件ではない。

【００１０】毛管ギャップが、コイル室と、弁ハウジングと保護スリーブとの間に形成された室との間での無圧体積補償のためには十分でない場合に、弁ハウジングに補償孔が設けられると有利である。

【００１１】

【実施例】以下に、本発明の実施例を図面につき詳しく説明する。

【００１２】図１に例示した、内燃機関の燃料噴射装置に用いられる電磁作動式の燃料噴射弁は、強磁性材料から成る管状の弁ハウジング１を有している。この弁ハウジング１内では、コイル枠体２に電磁コイル３が配置されている。コイル枠体２は段状に形成された、弁長手方向軸線７に対して同心的に延びるコア４を部分的に取り囲んでいる。このコア４は管状に形成されていて、このコア４を介して燃料供給が行なわれる。弁ハウジング１は電磁コイル３とは反対の側の端部で、軸方向において部分的にノズルボディ６を取り囲んでいる。弁ハウジング１とノズルボディ６との間を液密にシールするためには、ノズルボディ６の周面に環状溝１０が形成されている。この環状溝１０には、シールリング１１が配置されている。

【００１３】ノズルボディ６の、電磁コイル３寄りの端面１３と、この端面１３に軸方向で向かい合って位置する、弁ハウジング１に設けられた内側肩部１５との間には、ストッパプレート１６が締付け固定されている。このストッパプレート１６は、弁ニードル２１の運動を制限するために働く。この弁ニードル２１は、ノズルボディ６に設けられた、ガイド範囲を有する段付けされた長手方向孔１７内に配置され、かつ弁ハウジング１に設けられた段付けされた長手方向孔１８に突入している。弁ニードル２１にたとえば四角形体として形成された２つのガイド区分２２は、長手方向孔１７のガイド範囲を通って案内される。しかし、前記ガイド区分２２は燃料のための軸方向通過部を開放している。弁ニードル２１は半径方向の遊びを持って、ストッパプレート１６に設けられた貫通孔２３を貫いており、弁ニードル２１のニードルピン２５を備えた下流側の端部はノズルボディ６に設けられた噴射開口２６から突出している。ノズルボディ６の、前記ストッパプレート１６とは反対の側の下流側の端部には、円錐台形の座面２８が形成されている。この座面２８は弁ニードル２１の、弁閉鎖部分として働く端部と協働して、燃料噴射弁の開閉を行なう。

【００１４】弁ニードル２１の他方の端部は管状の可動子３０に固く結合されており、この場合、この可動子３０は座面２８寄りの範囲３２で弁ニードル２１の保持部分３３を取り囲んで、この保持部分３３に係合している。可動子３０の、電磁コイル３寄りの段部３４には、戻しばね３７の一方の端部が接触している。戻しばね３７の他方の端部は管状の調節スリーブ４０に支持されている。この調節スリーブ４０はコア４に設けられた、段付けされた貫通孔４１にプレス嵌めされている。

【００１５】コア４と弁ハウジング１とは軸方向において、少なくとも部分的にプラスチック被覆体４３によって取り囲まれている。電磁コイル３は電気的な接続コネクタ４５を介して接触接続され、ひいては励磁される。この電気的な接続コネクタ４５は、たとえばプラスチック被覆体４３と一緒に成形されている。プラスチックから製造された接続コネクタ４５には、たとえば金属性の２つのコンタクトピン４６が所属している。両コンタクトピン４６は電磁コイル３の巻き体と直接に接続されている。コンタクトピン４６は上流側で、電磁コイル３を取り囲むコイル枠体２から突出していて、プラスチック

射出成形時にプラスチックによって十分に取り囲まれている。コンタクトピン４６はそのピン端部４７でしか裸出していない。すなわち、ピン端部４７はプラスチックによって直接に取り囲まれていないので、対応するコネクタ部分（図示しない）との差込み接続が可能となる。

【００１６】プラスチック部分と金属部分との間の結合は完全に密ではない。すなわち、燃料噴射弁においても、コンタクトピン４６の、プラスチック射出成形時にプラスチックによって取り囲まれた範囲と、弁ハウジング１に被覆された、プラスチック被覆体４３の前記噴射開口２６寄りの端部の範囲とにおいて完全なシール性を保証することは不可能である。それどころか、金属部分、たとえばコンタクトピン４６と、プラスチック被覆体４３との間に極めて微細な毛管ギャップが形成されてしまう。特に熱作用時には、この効果は一層増幅される。なぜならば、プラスチックと金属との熱膨脹係数差に基づき、材料ずれが生ぜしめられるからである。内燃機関もしくは燃料噴射弁の運転時では、特に内燃機関に基づき、また電磁コイル３の加熱によっても、電磁コイル３と接続コネクタ４５との範囲において温度上昇が生ぜしめられる。この温度上昇はやはり毛管ギャップの形成を促進する。極めて微細な毛管ギャップの形成に基づき、コイル枠体２と弁ハウジング１との間に封入された空気と、燃料噴射弁の外部に存在する周辺大気との間に直接的な連通が生ぜしめられるので、燃料噴射弁がいわゆる「呼吸」をしてしまうおそれがある。

【００１７】燃料噴射弁の運転時における温度上昇時では、電磁コイル３およぼ封入された空気の体積膨張に基づき内圧が毛管ギャップを介して外方に減圧されるので、圧力平衡が維持される。冷却時では、圧力補償が逆の方向で行なわれる。特に内燃機関が著しく飛沫水の危険にさらされていると、燃料噴射弁の内部への液体の流入の危険が極めて大きくなる。毛管ギャップには純粋な水だけが吸い込まれる訳ではなく、別の粒子（たとえば塩）も連行されるので、コイル室４９における腐食は一層促進されてしまい、したがってコイル線材の破壊危険は排除されていない。

【００１８】本発明によれば、この問題は飛沫水ガードとして働く保護スリーブ５０によって解決される。この保護スリーブ５０は燃料噴射弁を外周で軸方向では少なくとも部分的に、かつ半径方向では完全に取り囲んでいる。たとえばプラスチックから製造された管状の保護スリーブ５０の、接続コネクタ４５寄りの上端部は材料接続的に、つまりたとえば超音波溶接によって、プラスチック被覆体４３に密に固定されており、それに対して保護スリーブ５０の、噴射開口２６寄りの下端部は弁ハウジング１を遊び嵌めにより取り囲んでいる。これによって、噴射弁の「呼吸空気」はそれぞれ、金属性の弁ハウジング１とプラスチック被覆体４３との間の毛管ギャップを介して、弁ハウジング１と保護スリーブ５０との間に形成された環状ギャップに流入する。プラスチックの他に、別の材料、たとえば金属も保護スリーブ５０のために使用することができる。保護スリーブ５０は噴射開口２６寄りの端部５２で、弁ハウジング１の外輪郭に類似して段付けされて形成されている。保護スリーブ５０の外側下方の段部５３は弁ハウジング１を取り囲んでいるが、ただし所定の間隔を持って取り囲んでいる。保護スリーブ５０と弁ハウジング１との間に形成された室５４は、保護スリーブ５０と弁ハウジング１との間での「呼吸」によって吸い込まれた液体を収容して、保持するために働く。

【００１９】前記室５４は多数の小さな通路もしくは毛管に分割されている。これらの通路もしくは毛管は保護スリーブ５０の内壁から半径方向内側に突入したリブ５７によって形成される。この場合、各２つのリブ５７が介在する１つの通路を制限している。図２には、保護スリーブ５０を備えた燃料噴射弁の断面図として、リブ５７の構成が示されている。各リブ５７の間に形成された通路の体積は、内燃機関もしくは燃料噴射弁の運転温度域にわたって生じる「呼吸体積」よりもはるかに大きく形成されている。これにより、吸い込まれた液体が燃料噴射弁の内部に流入しないことが保証されている。それどころか、リブ５７によって形成された、多数の小さな通路のラビリンスは揺動負荷時または位置変化時に毛管保持力に基づき、吸い込まれた液体が、燃料案内部分によってシールされたコイル室４９にまで進入することを阻止する。

【００２０】コイル室と、弁ハウジング１と保護スリーブ５０との間に形成された室５４との間での無圧の体積補償のためには毛管ギャップが十分でない場合には、保護スリーブ５０によってカバーされた範囲に、コイル室４９から弁ハウジング１の周面に通じた補償孔５９を設けることが有利である。

【００２１】図３には、保護スリーブ５０に設けられた多数の通路を有するラビリンスを形成するための別の実施例が示されている。リブ５７は半径方向に延びるように配置されているのではなく、円軌道に沿って延びるように配置されている。前記通路の種々異なる配置形式を有するさらに別の実施例（図示しない）によっても、前記機能を正確に満たすことができる。

【図面の簡単な説明】

【図１】燃料噴射弁の断面図である。

【図２】図１に示した燃料噴射弁のＩＩ－ＩＩ線に沿った断面図である。

【図３】保護スリーブにおける通路形成の別の実施例を示す断面図である。

【符号の説明】

１　弁ハウジング、　２　コイル枠体、　３　電磁コイル、　４　コア、　６ノズルボディ、　７　弁長手方向軸線、　１０　環状溝、　１１　シールリング、　１３

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端面、　１５　内側肩部、　１６　ストッパプレート、　１７　長手方向孔、　１８　長手方向開口、　２１　弁ニードル、　２２　ガイド区分、２３　貫通開口、　２５　ニードルピン、　２６　噴射開口、　２８　座面、３０　可動子、　３２　範囲、　３３　保持部分、　３４　段部、　３７　戻しばね、　４０　調節スリーブ、　４１　貫通孔、　４３　プラスチック被覆体、　４５　接続コネクタ、　４６　コンタクトピン、　４７　ピン端部、　４９コイル室、　５０　保護スリーブ、　５２　端部、　５３　段部、　５４　室、　５７　リブ、　５９　補償孔

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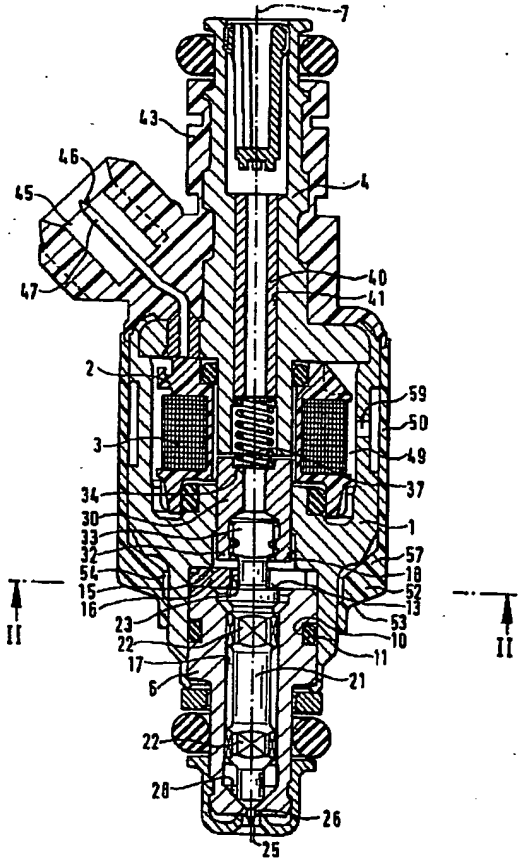
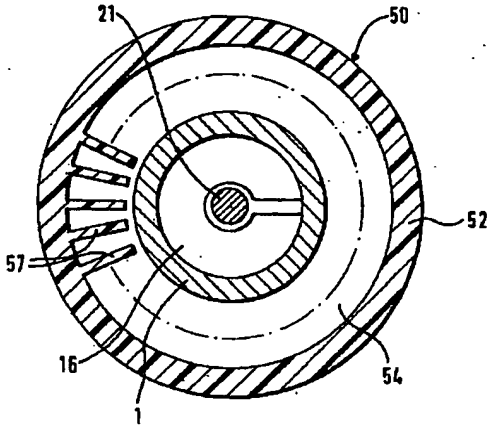
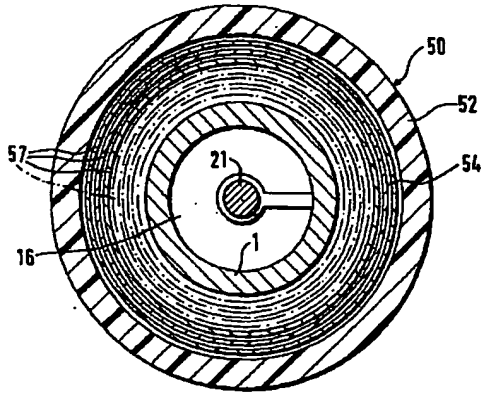
【図１】



【図２】



【図３】



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